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# Preserving Han-Ok:

Reimagining the Korean Traditional House for Today using 3D Design

## Haiden Park

A Thesis submitted in partial fulfillment of the requirements for the degree of  
Masters of Fine Arts in Visual Communication Design

**School of Design**

**College of Imaging Arts and Sciences**

Rochester Institute of Technology

Rochester, NY

December, 2014

# Acknowledgements

Without the support of the following people, none of this would have been possible.

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Chris Jackson, David Halbstein, Shaun Foster

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# Abstract

## Keywords:

**South Korea, Han-Ok(Korean Traditional House), Culture, Korean tradition, Architecture, 3D Modeling, Camera Movements**

The purpose of this thesis project was to preserve the traditional elements of Han-Ok in the modern architecture in Korea. I have integrated traditional Korean design elements into modern architecture. I also solved the problems that the Han-Ok currently faces. This topic is important because a lot of the traditional culture has been disappearing within the current Korean society. Of all the aspects of Korean traditional culture, the Han-Ok, the Korean traditional house itself, is very important. A lot of Korea's culture is represented in the Han-Ok, but people think this type of architecture is unnecessary and uncomfortable, and because of this people are pursuing another direction. It is important in our society to preserve the traditional culture from the past to pass on to future generations. I researched every component of the Han-Ok itself; identifying the weaknesses of the house, Korean traditional culture, and modern architecture. Finally integrated the Korean traditional style into modern architecture. The scope of my thesis focused heavily on the areas of architecture, camera movement, and 3D modeling within this industry.

# Introduction

My design research problem is to preserve the Han-Ok, the traditional Korean house, using computer graphics design. The Han-Ok is fading away within the current society, so I want to preserve the traditional design elements of the Han-Ok in modern architecture in Korea. A lot of Korea's culture is represented within the Han-Ok. The house itself is a Korean tradition, and because of this the Han-Ok should be kept alive and not forgotten. Designers and architects have approached this subject in the past, but they have only mentioned the problems rather than trying to solve them. I am approaching this in a different way; I modeled in 3D a typical modern Korean house, preserving most of the important details about the Han-Ok. This design will target Korean architecture companies and Korean universities that have been researching this problem, but it will also target members of the current generation who don't really know about the Korean tradition. From research and sketches to final 3D models and 3D motion is the workflow and field that I am experienced in, and with these skills I will successfully tell the story of the Han-Ok.

# Review of Literature

In regard to my overview of the literature, I learned more than I expected to about the Korean tradition and how people are trying to solve this problem today. The main topic that I researched was the Han-Ok itself, since the Han-Ok is the main the topic of my thesis. While going through the literature, I learned a lot about Traditional Korean culture and the Han-Ok. It was very interesting how the Han-Ok has been maintained in the past years since it was created, as well as how society changed and people wanted to solve this problem in many different ways. Because of the society changing, the Han-Ok has a lot of features that people in this generation think are uncomfortable, and they do not think it is necessary for them to live in a Han-Ok. The one thing that kept me most interested was that researchers knew about this problem and have tried to solve it, but it didn't quite work. When taking on this project, I wanted to solve this problem so that the future generation could learn about traditional Korean culture while integrating it with modern architecture so it can carry on. To know what I was dealing with, I researched how other people have approached this problem and how they tried to solve it. I also went on to research current architectural technology and how I could integrate it with Traditional Korean culture. After performing this research, I decided to design a whole new architectural building that includes important aspects of traditional Korean culture.



# Subject Matter

## **Developing Design models for revitalizing Han-Ok**

**by Lee Gang Min, Lee Min Kyung, Hwang Jun Ho Korean Architecture Research Lab  
December 2012**

<http://www.auric.or.kr/User/Rdoc/DocRdoc.aspx?BrsDataBaseName=R- DOC&PrimaryKey=294570&DBNM=RDCR>

The research is a plan to create demand for Han-Ok by improving the settlement environment of deteriorating Han-Ok dwellings and providing a suitable living space in modern life. The purpose of the research is to develop and propose an effective manual (handbook) as a reference for Han-Ok remodeling. Two parts are mentioned: spatial changes and performance advancement.

## **A study on methods of system improvement and on policy measures for conservation and management of existing Han-Ok**

**by Shim Kyung Mi, Jin Tae Seung Korean Architecture Research Lab  
December 2012**

<http://www.auric.or.kr/User/Rdoc/DocRdoc.aspx?BrsDataBaseName=R- DOC&PrimaryKey=295222&DBNM=RDCR>

The research aims to present methods of system improvement and provide policy measures for the conservation and management of existing Han-Ok units, acknowledging the importance of preventing the destruction and consistent management of existing Han-Ok units as much as that of distributing new Han-Ok.

## **Han-Ok's problems and problem solving**

**By: eokish**

**Published: March 30, 2009**

<http://blog.naver.com/PostView.nhn?blogId=eoklsh&logNo=64592478>

This website talks about the problems that the current society is facing regarding the Traditional Korean house (Han-Ok). It describes various problems and then shows floor plans of the house and the houses that people are living in right now.

## **Improvements for maintenance of Han-Ok**

**by Lee Tae Young, Yang Yoon Sun, Lee Chan Shik Korean Architecture Management Company November 2011**

<http://www.auric.or.kr/User/Rdoc/DocRdoc.aspx?BrsDataBaseName=R- DOC&PrimaryKey=244727&DBNM=RDCR>

Demand for the Han-Ok has not increased in spite of active government efforts because the Han-Ok is difficult to maintain. It is necessary to determine methods of improvement to revive the Han-Ok. This study searched for problems of maintaining the Han-Ok and conducted a survey of Han-Ok residents.

## **A study on methods of system improvement and on policy measures for conservation and management of existing Han-Ok**

**by Shim Kyung Mi, Jin Tae Seung Korean Architecture Research Lab December 2012**

<http://www.auric.or.kr/User/Rdoc/DocRdoc.aspx?BrsDataBaseName=R- DOC&PrimaryKey=295222&DBNM=RDCR>

This research aims to present methods of system improvement and provide policy measures for the conservation and management of existing Han-Ok units, acknowledging the importance of preventing their destruction and providing consistent management of existing Han-Ok units as much as that of distributing new Han-Ok.

## **Auri National Han-Ok Center**

<http://www.hanokdb.kr/main/portal/main.do>

This website talks about technology and how Han-Ok presents problems to the current society. A few problems are that the houses themselves are expensive, the designs are old, and their efficiency is low. It talks about how they want to improve these houses so that they can fit into current society.

# Design

## **Han-Ok Design**

**Anna Eomji Sung**  
**2012**

<http://www.thehanokhouse.com/>  
<http://eomjidesign.com/hanok.html>

This website tells you all about the exterior and interior design of the Han-Ok. It describes the history of the form and what kind of Han-Oks there are. It also depicts floor plans and what materials the houses are made out of.

## **Characteristics of Han-Ok**

**By: Kim Jang Gwon 2009, Hanstyle**

<http://www.auric.or.kr/User/Rdoc/DocRdoc.aspx?BrsDataBaseName=R-DOC&PrimaryKey=295222&DBNM=RDCR>

The research aims to present the characteristics of Han-Ok. It talks about how the house itself can show characteristic to people viewing. With the materials, designs and other characteristics it shows what kind of house it is.

## **Han-Ok's problems and problem solving**

**By: eokish**  
**Published: March 30, 2009**

<http://www.han-style.com/english/hanok/meaning.jsp>

This website talks about Han-Ok in a lot of different ways. It defines the Han-Ok, and discusses Korean wisdoms with Han-Ok, aesthetics of Han-Ok, tales contained in each component of Han-Ok, and even Han-Ok construction in 3D images and computer modeling.

## **Han-Ok, the 09-spacetracing cut**

**By: motoelastico**

**2009**

<http://vimeo.com/3392606>

This video shows you the model and design of the traditional Han-Ok, placing real photos in context. It is a space-tracing test that merges a pre-production 3D model with pre-production photographs.

## **Han-Ok –Korean Traditional houses**

**By: Lovearirang**

**Documentary, Korean traditional architecture**

**June 5, 2011**

This video is a documentary about Han-Ok design and how it was built; it also mentions how the building materials are used in this form of architecture. It describes the history of Han-Ok as well as the meaning of its existence and the meaning of each structure of the building.

## **Korean Art Book**

**By: Jung Byoung Mo**

**Date of publication: May 15, 2001**

**Edition or revision: June 1, 2007**

**Publisher: Ace Color**

This book is all about traditional Korean art and its history. It is about Korean art and includes what kind of art was used for decorating the Han-Ok. So this book tells you about traditional Korean design.

# Technology

## **Korean housing**

### **Blog**

#### **Department Global Communication and Content Division**

<http://www.korea.net/AboutKorea/Korean-Life/Housing>

This blog talks about the heating system of the Han-Ok. It uses the Ondol system, which channels smoke and heat generated from low-lying kitchen stoves through pipes built under floors.

### **Han-ok (Korean Traditional housing)**

#### **The Voluntary Agency Network of Korea (VANK)**

[http://www.prkorea.com/english/e\\_intro/e\\_introto4\\_4.htm](http://www.prkorea.com/english/e_intro/e_introto4_4.htm)

This website talks about the magnificent advantages of Han-Ok, including the Ondol heating system and the materials used for the floor. It also talks about the structure of the Han-Ok, which is the main building, the men's part of the house, the servants' quarters, the separate house, and the floor plans.

### **Auri National Han-Ok Center**

<http://www.hanokdb.kr/main/portal/main.do>

This website gave me a lot of information about Han-Ok architecture. It talks about Han-Oks' technologies, theories, and locations. In the theory section is a description of how it fits with nature and how the lines of the house are beautiful. The technology section describes how Koreans used the technology in the past.

## **[Column] Korea's Most Powerful Technology: The Traditional Han-Ok House**

**By: Emanuel Pastreich Column, The Hankyoreh**

**Published: June 4, 2012**

[http://english.hani.co.kr/arti/english\\_edition/e\\_opinion/535954.html](http://english.hani.co.kr/arti/english_edition/e_opinion/535954.html)

This column talks about how the Traditional Han-Ok itself uses technology. It talks about how Korea has been losing ground in one field of technology: the traditional skills of carpentry and design associated with the building of the Traditional Korean Han-Ok house.

## **Architecture Ando Dadao**

**By: Ando Dadao**

**Date of publication: November 10, 2009 Edition or revision: December 21, 2009**

**Translated by: Lee Kyu Won**

**Publisher: Cheon-Il Company**

This book is all about the architecture of Ando Dadao and his life. It discusses how he was born as an architect and talks about his architectural designs. I chose this book because it also talks about the traditional Korean house and how technologies work inside the house. It also talks about the materials and technology of the current architecture and past architecture.

# Han-Ok Design

The starting point of my process was the Han-Ok itself, which represents the traditional Korean culture. Regarding my research, when you want to build something architectural in an interior you should always start with the architecture. In my background and in the research I performed, there were quite a few different styles of Han-Oks. They had different styles of roofs and used different materials to create the house. While I was doing my research I noticed that there were three different kinds of roofs used for the Han-Ok. The first one, the eight-sided roof, was used the most. This roof has two sides, like a typical roof, and then three sides in both the front and back. The second type of roof is like a typical style of roof that looks like a modern roof. The third one is called a Woojingak roof, and it is a four-sided roof but the front and back are tilted diagonally. Most of the houses are made out of wood and stone materials, but some are just made out of stone. For example, the house has five typical features. First, the roof is made out of Ki-wa's, a tile material that is layered over the roof and is curved so when rain falls the water can come down but misses the house. Second, the Maru is a wooden platform in front of the door. Third are the wooden pillars that support the roof, which are all around the house. Fourth are windows that are made out of paper, and the last is the Chauma, the corners of the roof that have a particular style. From the different styles of Han-Oks, I decided to focus on the most traditional style, but instead of the Woojingak roof, I decided to go with the second one, the typical style roof.

Once I had narrowed down which style I wanted to focus on, I started to do some sketches. I began researching what kinds of materials they used specifically to create the roof and the house and how I would integrate the modern architectural style into the Han-Ok. For example, I decided I wanted to go with the most traditional style of Han-Ok, except for the roof, by using materials such as Ki-wa and wood, while all of the exterior of the house is made out of wood. After researching and thinking about how I would integrate modern style, I decided to go traditional on the exterior, like in *Fig. 1* and *Fig. 2*, by keeping all five points of the house. However, I would keep the interior modern with some traditional objects, such as sliding windows. Furniture such as the bed and sofa would be traditional (*Fig. 3*).

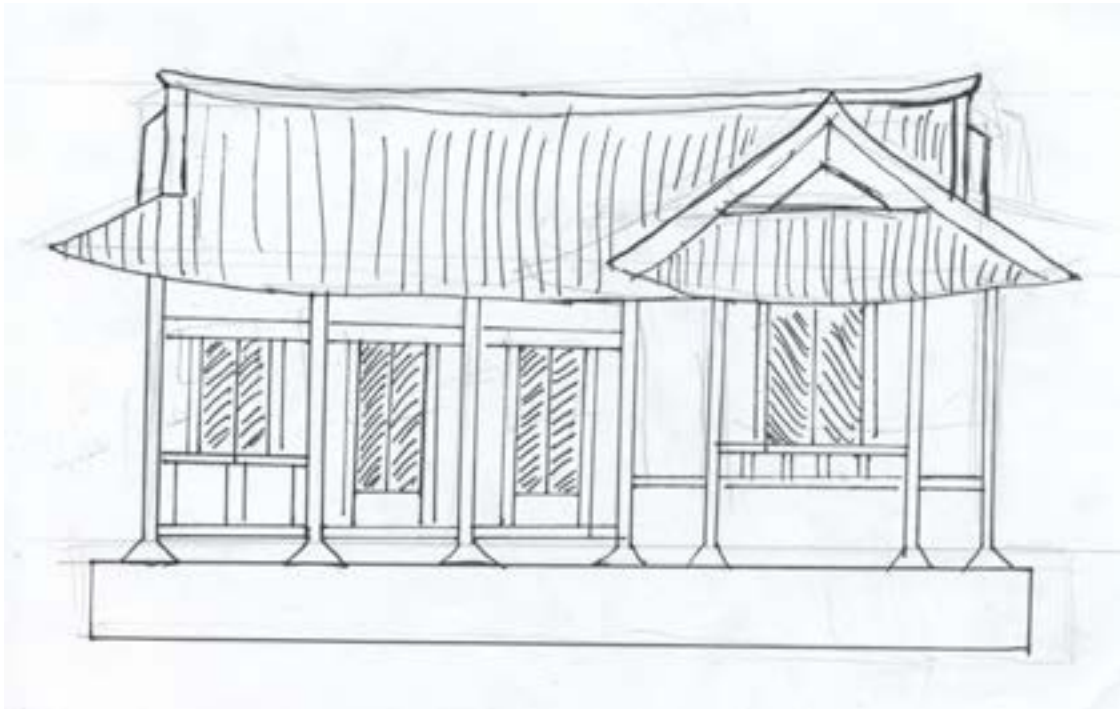


Fig. 1. Haiden Park  
*Han-Ok Concepts*, 2014  
Black Pen, 8.5in x 11in



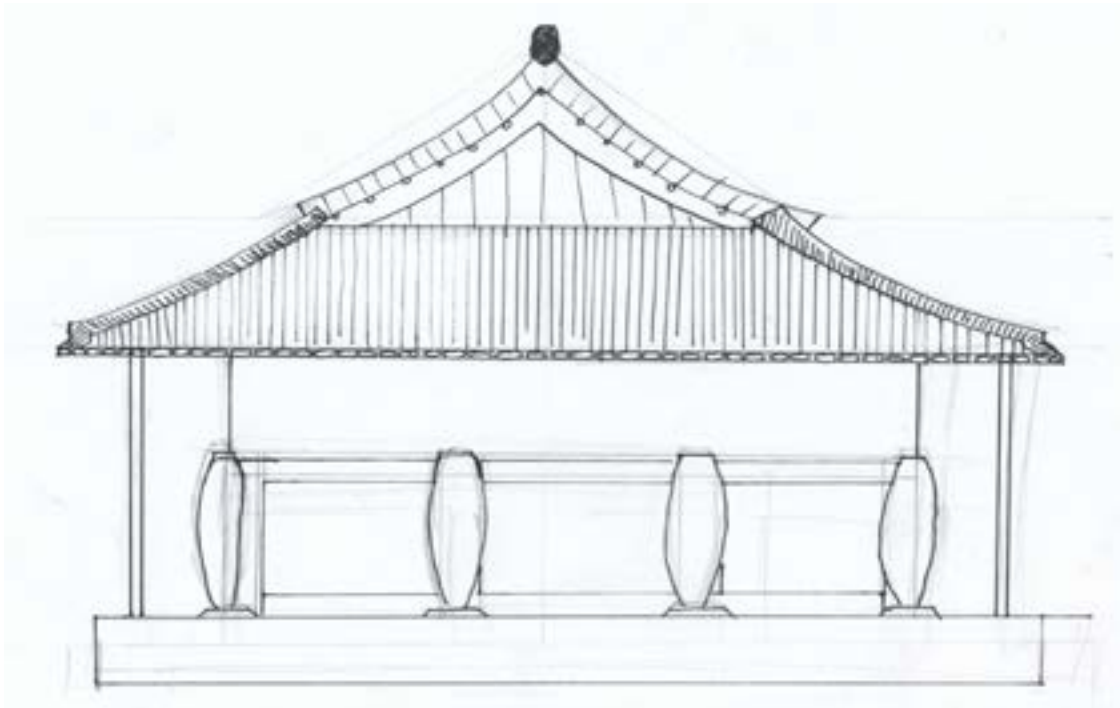


Fig. 2. Haiden Park  
*Han-Ok Concepts*, 2014  
 Black Pen, 8.5in x 11in



Fig. 3. Haiden Park  
*Han-Ok Concepts*, 2014  
 Black Pen, 8.5in x 11in

# Floor Plan

After I decided on the style, the next step was to create the floor plans for the house. At first I wanted to integrate both modern and traditional style floor plans, as can be seen in *Fig. 4*. The dining room, kitchen, and living room are all connected together like in the traditional style floor plan, and the bedroom, two bathrooms and hallway are from the modern architecture floor plans. All the doors for the rooms, hallway and bathroom are doors in the modern style. But after researching traditional style floor plans more extensively I decided to change my floor plan. I discarded the integration of the traditional and modern and made it more traditional. Instead of sketching, I decided to make a mockup model to see it in 3D (*Fig. 5*). All the rooms are the same except I discarded the second bathroom next to the hallway and made that space part of the hallway, making it bigger. The reason for this is that in traditional Han-Ok floor plans, there is a space in the middle of the house where one can rest and put on one's shoes. Then, instead of making the doors open up like modern ones, I placed all the doors surrounding the middle resting place and made them all sliding doors for a more a traditional look.

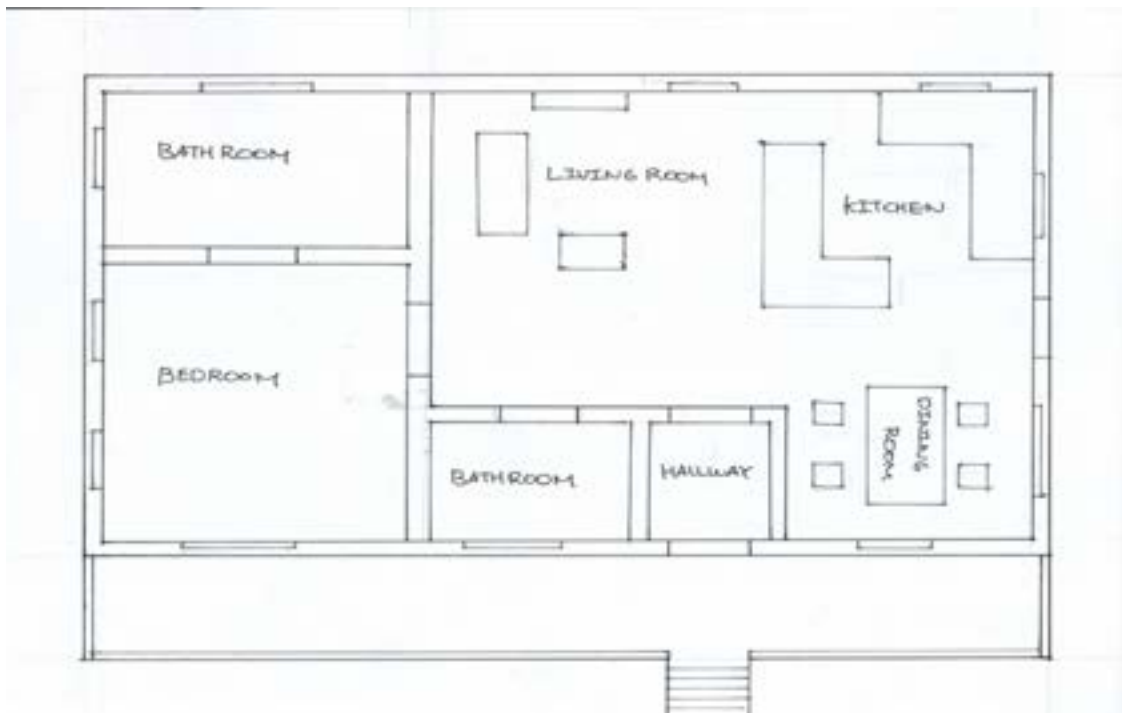


Fig. 4. Haiden Park  
*Han-Ok floor plan*, 2014  
Black Pen, 8.5in x 11in



Fig. 5. Haiden Park  
*Han-Ok floor plan*, 2014  
Maya, 1024 x 768

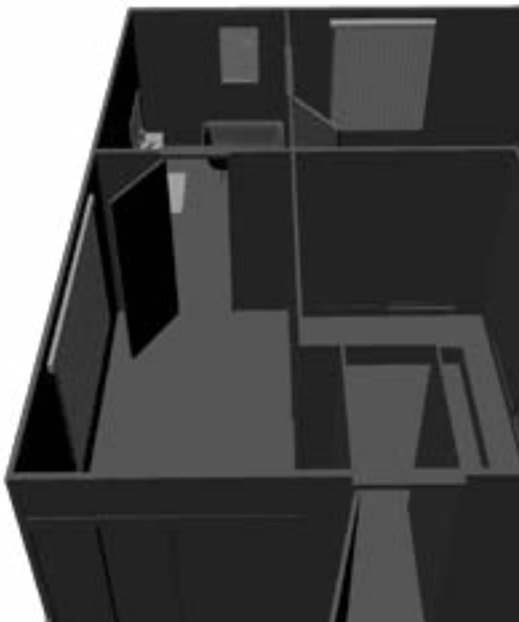


Fig. 6. Haiden Park  
*Han-Ok floor plan*, 2014  
Maya, 1024 x 768

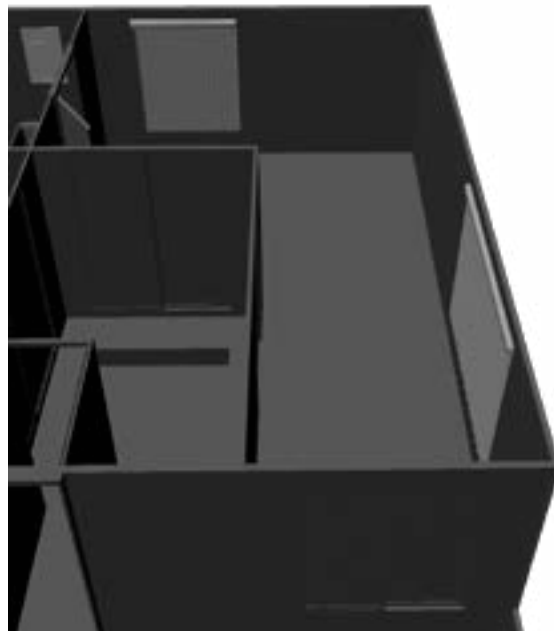


Fig. 7. Haiden Park  
*Han-Ok floor plan*, 2014  
Maya, 1024 x 768

# Roof Design Process

After deciding on the floor plan, I started to model the roof of the house; I wanted to go with a triangular shape for the roof. I used a workflow of modeling everything separately and combining the details together. The starting point for my roof was actually a platform (Fig. 8). After creating the platform, I modeled the top part of the roof in a triangular shape. After modeling the basic structure I started to add the details to the roof.

First I modeled the logs for the platform of the roof, and then I modeled the roof tiles called Ki-wa's. Ki-wa's are the main materials of the roof and are curved out so that the rain falls down to the ground (Fig. 9). After modeling the Ki-wa's and logs, I modeled the front and back of the roof. For the front and back I decided to go with something different than the traditional roof; instead, I designed the logs to come out a little in the front and back and then went with the cross shape details on the inside (Fig. 10).

I changed this because I wanted more details. Since there are layers of Ki-wa's on the roof, I wanted similarity, so I decided to go with this.

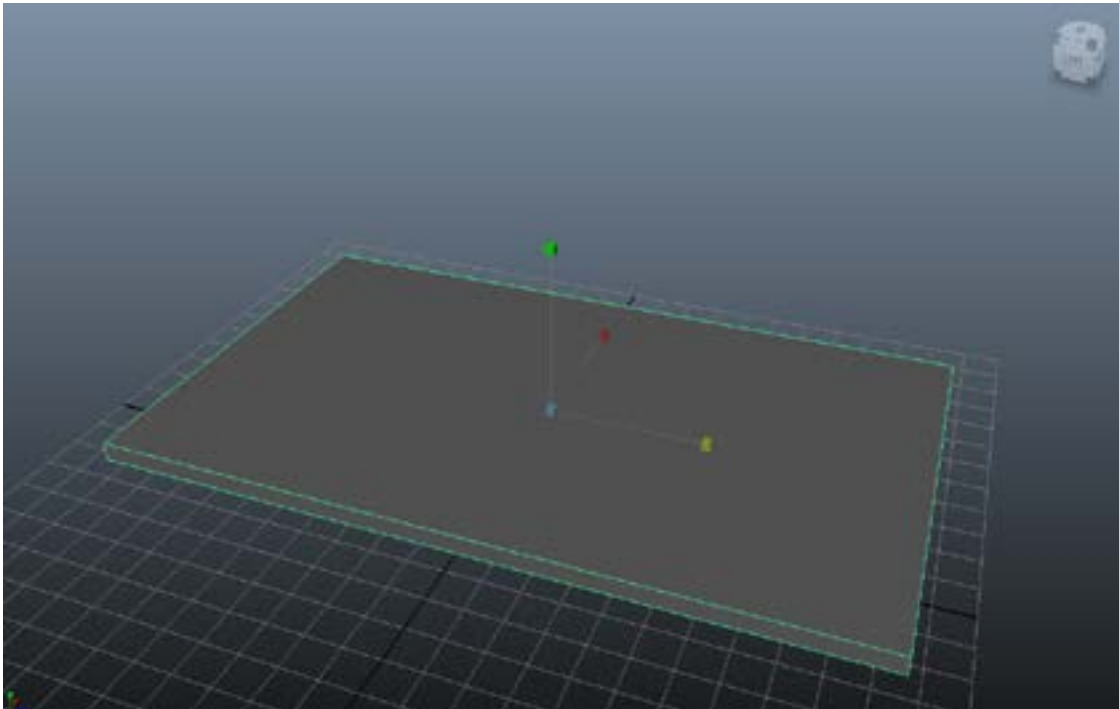


Fig. 8. Haiden Park  
*Roof Platform*, 2014  
Maya, 1024 x 768

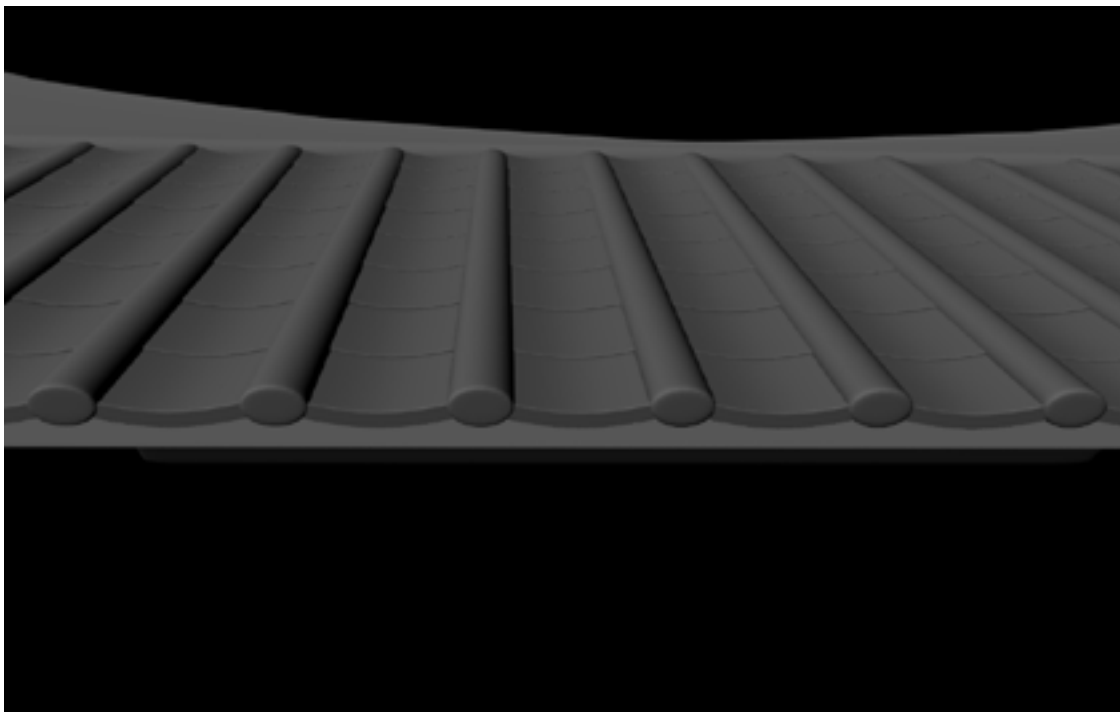


Fig. 9. Haiden Park  
*Roof, Kiwa* , 2014  
 Maya, 1024 x 768



Fig. 10. Haiden Park  
*Roof* , 2014  
 Maya, 1024 x 768

# Interior Design

With the exterior modeling done it was time to start modeling the interior. Since the exterior of the house was mainly focused on a traditional appearance, I wanted the interior to be more modern. Also since this house is made for modern society, it would make sense to have a more modern style of furniture. Even though most of the furniture were going to be modern, I also wanted to have some traditional pieces of furniture integrated within the house. So I started to research traditional Korean furniture. Some of the styles were different, but other styles were kind of the same. There were different styles of furniture for each part of the room. Some of the traditional rooms were very old. For instance the kitchen was very old, for people who are living today it would be uncomfortable, unrealistic, and unnecessary. These are the reasons people don't really want to live in Han-Oks, so I am going to model almost all of the furniture with the current features while inserting some of the traditional model art techniques they used in the past. All of the rooms will be remodeled with the current technology and current materials while preserving some of the traditional arts so that you can see both the past and present in the house.

# Dining Room

With most of the research done for the interior, I started to model furniture using a program called Maya. Since most of the furniture would be modern, I started to model those pieces first. I started with the dining room and moved my way up to the bedroom. I wanted to have the table made out of glass so you could see through it. I also wanted to give the chairs a kind of twisted feel in the bars. I had some trouble modeling the chairs, especially the bars, because of their twist. I had to create short bars and then twist them, but every time I twisted the bars they became weird. After a few trials they finally came out the way I wanted. I gave the dining table set five chairs because a typical dining table set usually has five chairs. After modeling the dining table, I noticed that since the room was not that big, it would take up most of the space in the dining room. This made me change some of the ideas I had come up with. Putting only the dining table would make the room empty, so I decided to insert a plant next to the table. Since there was still some room left, I decided to insert a Korean traditional lamp made out of paper and bamboo. The dining room and the kitchen are connected, so I inserted a room divider, which is an object of traditional Korean furniture that is used within the Han-Ok to divide rooms. The divider can move sideways to open and close (*Fig. 11*).

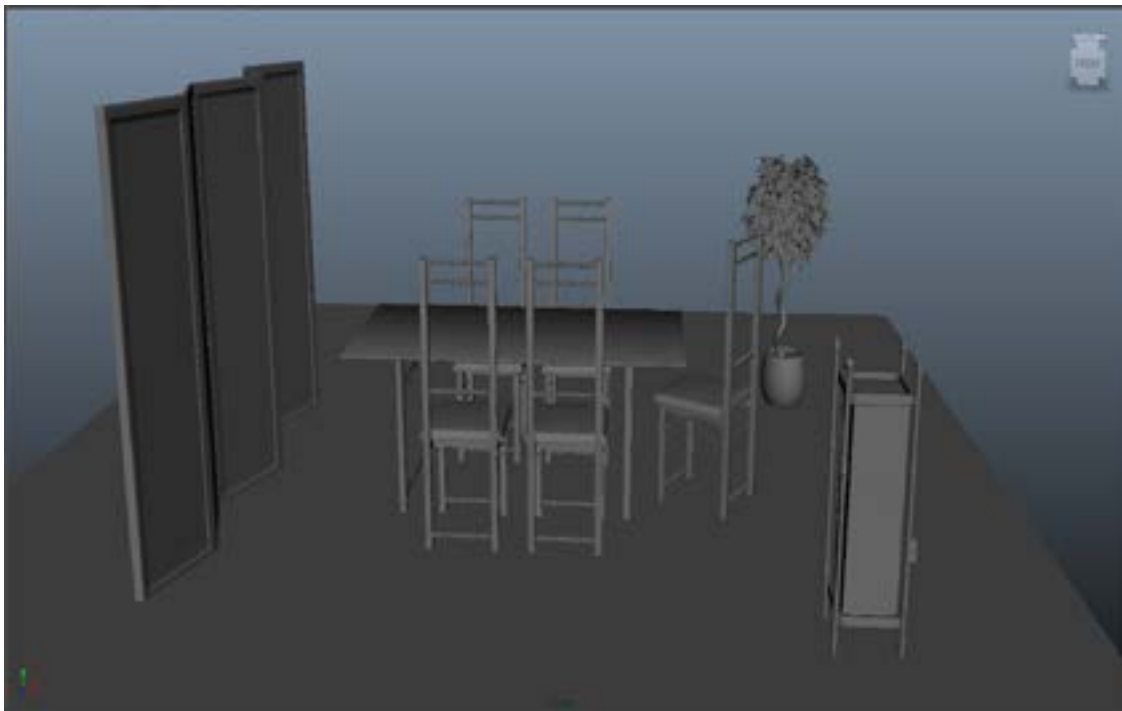


Fig. 11. Haiden Park  
*Dining Room*, 2014  
Maya, 1024 x 768

# Kitchen

With the limited space, I had to figure out how to make it less compact with all the objects that I wanted to model. So I decided to use the corner space of the kitchen. I created a counter using the corner space of the house while inserting the sink and oven within the counter. I ran into a few problems while modeling the sink. First, after creating the hole for the sink I went on to model the sink cover, but then I had a problem matching the sink and sink cover. I duplicated and extracted the face from the sink and created the sink cover from there. After that, I went with the sink water pipe. When I bend objects I usually use the bend tool, but it wouldn't bend the way I wanted it. I had to bend it manually by extracting and bending the faces. The counter has a few shelves incorporated in it and some cupboards. After modeling the counter I modeled the refrigerator. Since there were a lot of different designs, it was hard for me to choose which one I specifically liked, but I decided to go with the four-door refrigerator. After modeling the refrigerator I put it next to the counter, but it seemed kind of awkward so I decided to model a cupboard next to the counter so it could be right next to the refrigerator. Then I modeled another cupboard so it could fill up the emptiness at the top of the counter and a microwave. To add decoration I also modeled a plant (*Fig. 12*).



Fig. 12. Haiden Park  
*Kitchen*, 2014  
Maya, 1024 x 768



# Living Room

For the living room I started to model the couch first to see how the space would be filled up with the couch in it. I originally had two couches in my mind for modeling, but then with the space I had I decided to withdraw the idea of two couches and create one couch and one footrest. For the couch I wanted to give it a more square shape because the traditional Korean couches are usually square shapes. After the couch I modeled the table, for which I was also thinking of using glass. Since it was the living room I wanted to add some Korean traditional style furniture, so I decided to model a traditional shelf that would be used in the living room for multiple purposes. On top of the shelf I modeled the television set, and right next to them, I modeled a Korean traditional vase and lamp for decoration purposes. After I finished modeling I started to rearrange the models in the living room to fit. Then I noticed there was an empty space on the wall behind the television. I was thinking what I could put there to fill up the empty space, and I decided to go with a bookshelf. Instead of modeling a modern one, I wanted to go with something traditional. I started to research what kinds of bookshelves were used in the past. After debating between some styles I decided to go with the most traditional wall hanging bookshelf (*Fig. 13*).

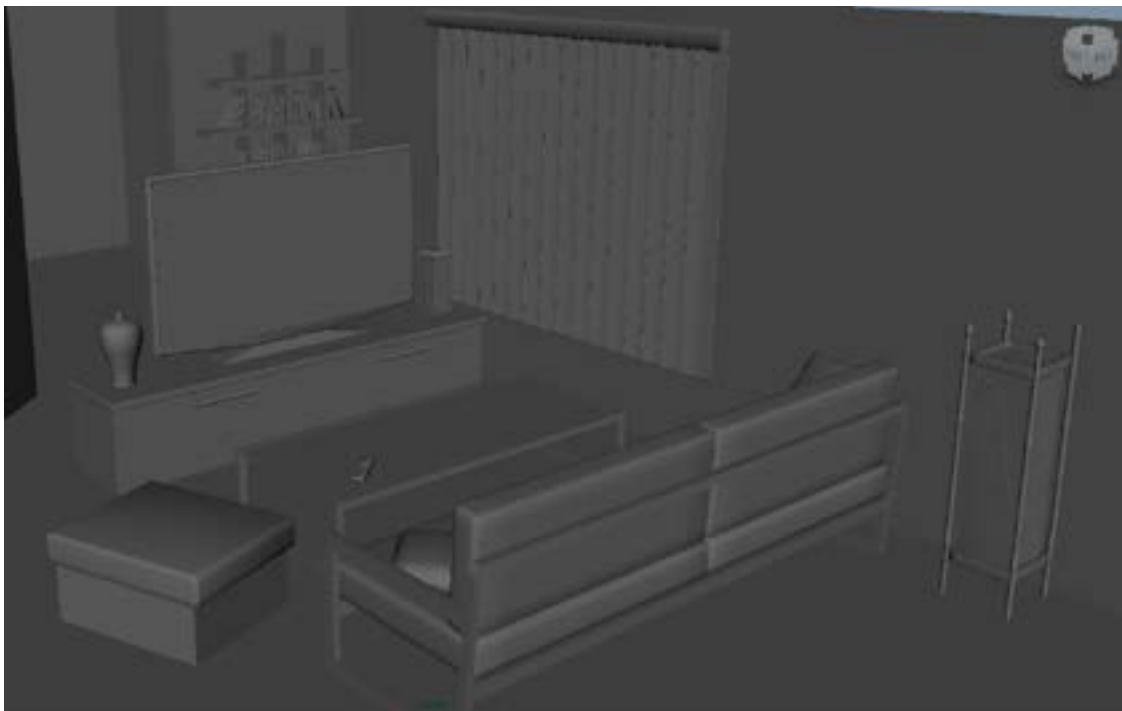


Fig. 13. Haiden Park  
*Living Room*, 2014  
Maya, 1024 x 768

# Bathroom

I wanted to make it very simple with just the basic necessities that were needed. While I was researching the Han-Ok, half of the problems that people had with the Han-Ok related to the bathroom. The room space was small, the toilet was uncomfortable, it was located on the outside of the house so it was cold, and it would get dirty. Because they didn't have anything to clean the toilet after using it, it usually piled up in the hole right below the toilet so it smelled and was not good for one's health. Because of these issues, I went with a more modern style of bathroom. By going with the modern style, I got rid of the problems that people have with old traditional style bathroom (*Fig. 14*). I had some problems while modeling the bathroom as usual; first was the shower curtain. At first I went with the curtain spreading out over the whole bath tub. But then I thought it looked unrealistic so I folded it, but the problem was modeling the folded curtain. It gave me a hard time, so I created a square polygon, extruded the sides manually, and smoothed them. For the sink, creating the base model was simple but then it was hard for me to model the sink, so I created a sphere and used boolean.

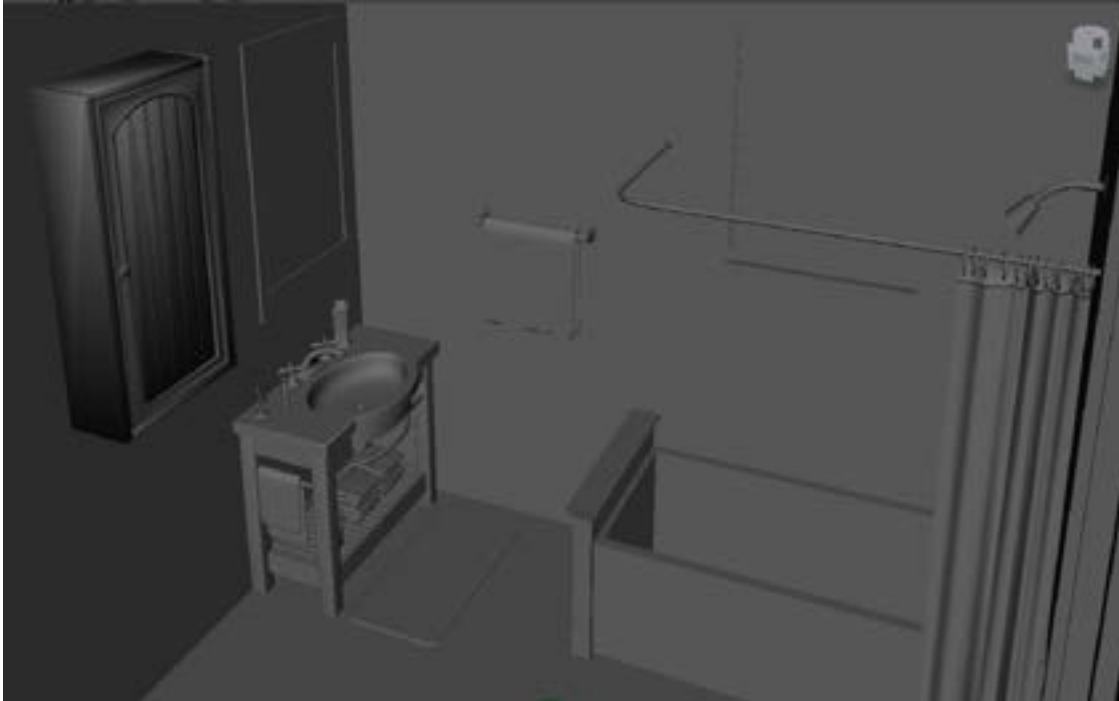


Fig. 14. Haiden Park  
*Bathroom*, 2014  
Maya, 1024 x 768

# Bedroom

The most interesting part about the bedroom is that there is actually a sliding door that connects to the outside, as in most Han-Oks. I started modeling with the bed because it is the most important part of the bedroom. I gave it a more modern look with just a little twist of making the platform of the bed flat like a traditional bed. Traditional style beds are all flat, and they don't have any mattresses, so I went with that part of the style and incorporated it into the bed. I also placed the bed right next to the sliding door that is connected to the outside so one could see the view from the bed. After modeling the bed and placing it in the room to see the space I went on to model the desk, chair, closet, and other objects. With the existing space, I placed the desk in the right corner of the bedroom and the closet in the other corner. I also wanted some kind of traditional object in the room, so I decided to put in a traditional Korean lamp next to the bed (*Fig. 15*).

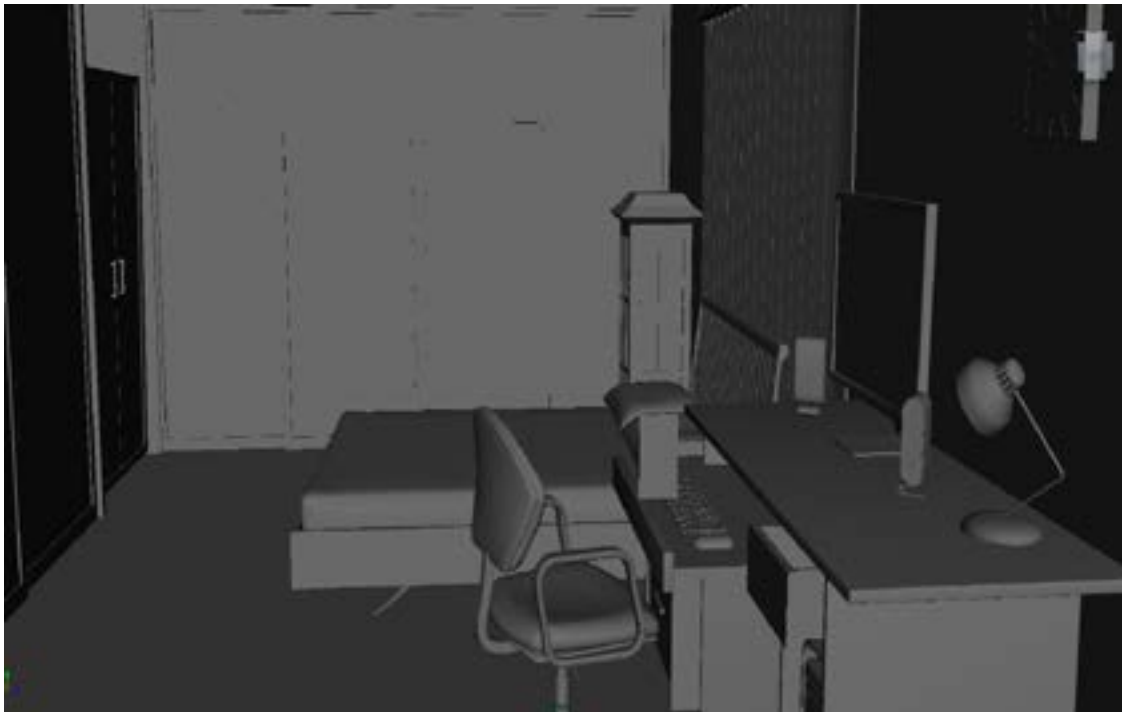


Fig. 15. Haiden Park  
*Bedroom*, 2014  
Maya, 1024 x 768

# Materials and Textures

After I finished modeling all of the pieces of furniture and placing them inside the house, I started to add textures to the house and furniture. Instead of using Maya for the textures as I usually do, I instead imported all of my models (the house and furniture) into Cinema 4D to create the textures I wanted (*Fig. 16, Fig. 17*). I was going to use camera movements from Cinema 4D to show the whole house, but I couldn't bring the textures into Cinema 4D if I had textured them in Maya.

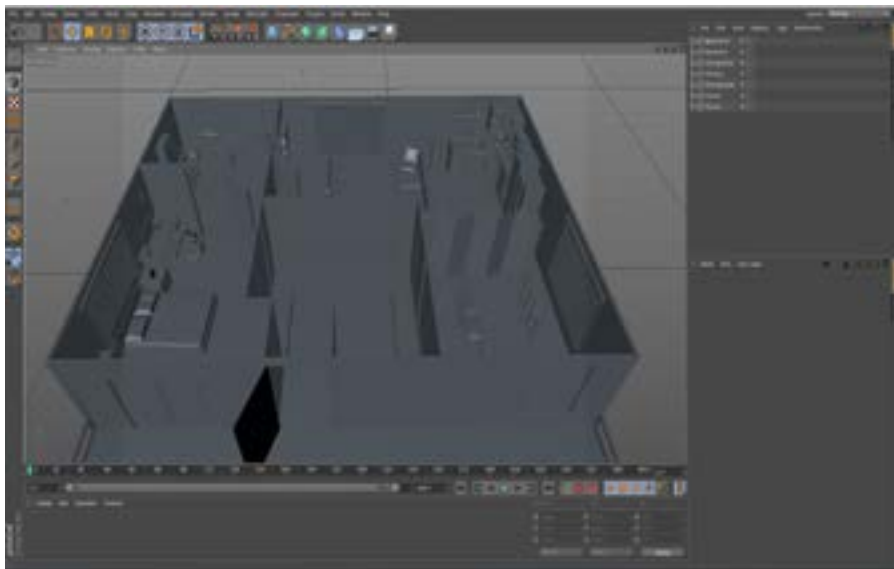


Fig. 16. Haiden Park  
*House*, 2014  
Cinema 4D, 1024 x 768

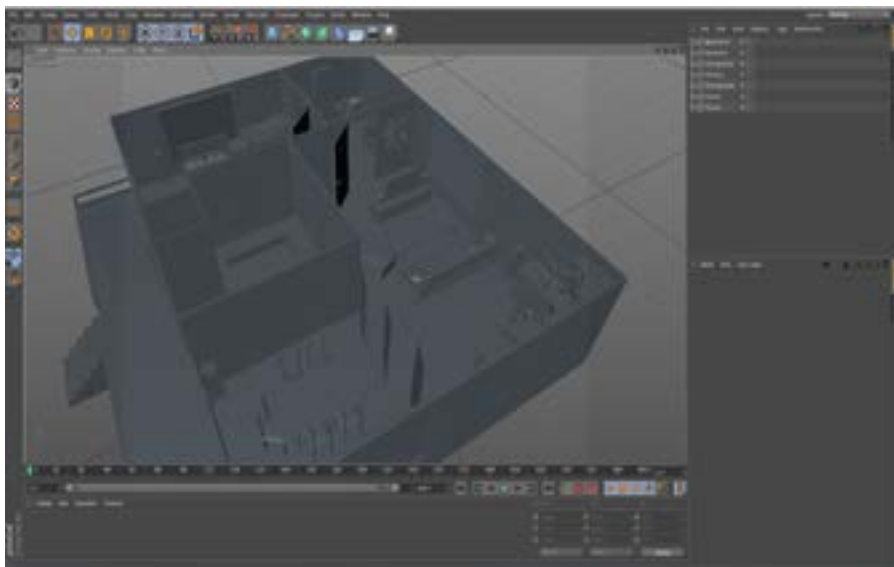


Fig. 17. Haiden Park  
*House*, 2014  
Cinema 4D, 1024 x 768

For the textures I tried to use realistic textures for my models and house (Fig. 18). For the roof I wanted to give it a more traditional look, so I went with a blue and green wood texture. The house itself was plain white with a slight gray texture, like most modern houses (Fig. 19). For the interior wall I used a plain white wallpaper texture and then a solid gray color texture for the carpet. After creating the textures for the exterior and interior of the house, I went on to create the textures for the rooms' furniture. For the dining room I created a glass material for the table, and a red silk-like texture and black texture for the chairs. For the traditional lamp I went with bamboo textures for the supports and paper material for the lamp itself. As usual, I used green and brown for the plant (Fig. 20).



Fig. 18. Haiden Park  
Materials, 2014  
Cinema 4D, 1024 x 768



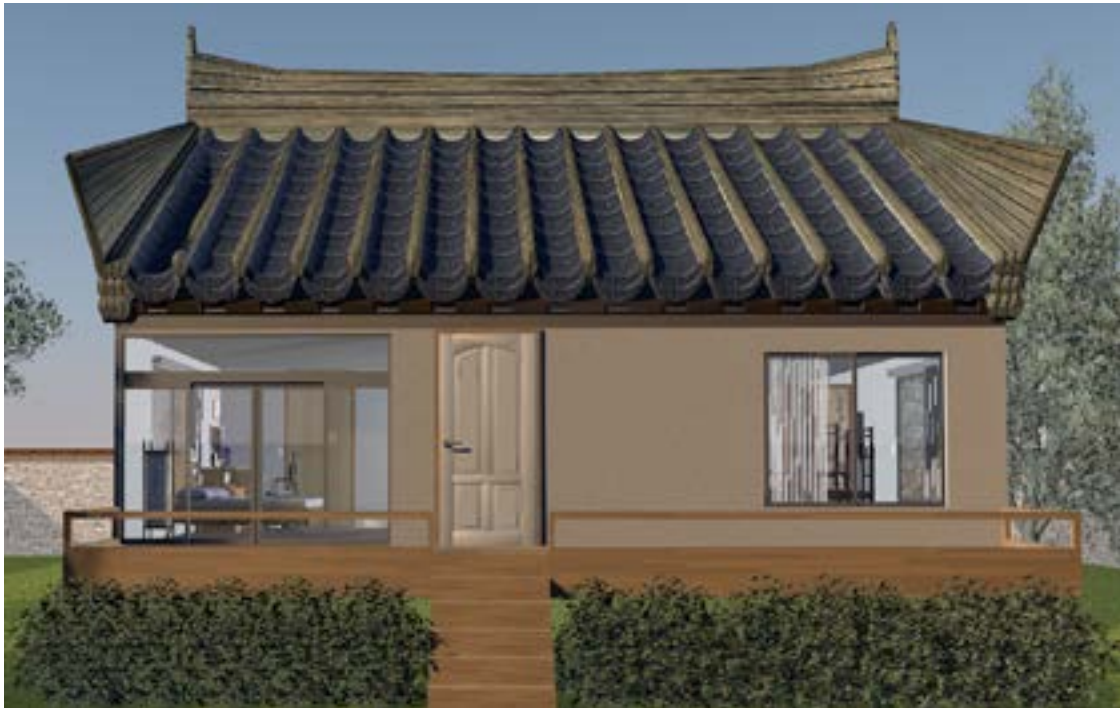


Fig. 19. Haiden Park  
*House exterior*, 2014  
Cinema 4D, 1024 x 768



Fig. 20. Haiden Park  
*Dining Room*, 2014  
Cinema 4D, 1024 x 768

In the kitchen I used wood textures for the counter and shelves and then marble textures for the countertop. Then as a typical kitchen texture I used a different plastic color and glass textures for accessories (*Fig. 21*). For the living room sofa I created a plain white soft material for the cushions and black plastic material for the supports. I created a red wood texture for the traditional TV table to make it look like a traditional shelf. For the table I used a glass material for the top and the same black plastic material as the couch for the supports (*Fig. 22*). In the bathroom I went with the typical textures that are used in modern days, like gray plastic for the toilet and white for the sink and bathtub. After using all these textures I noticed that it looked pretty simple, so I made some colorful textures for some highlights. The towel is light blue, the shower curtain is light purple, and the towels under the sink and accessories for the sink have some color too (*Fig. 23*). In the bedroom I also went with typical textures such as white for the bed and wood textures for the desk. Like in the bathroom, I tried to make some colorful highlights, such as the light purple pillows and the desk lamp with a little blue color (*Fig. 24*). For the outside background I went with a grass texture for the ground to display grass (*Fig. 25*).



Fig. 21. Haiden Park  
Kitchen, 2014  
Cinema 4D, 1024 x 768



Fig. 22. Haiden Park  
*Living Room*, 2014  
 Cinema 4D, 1024 x 768



Fig. 23. Haiden Park  
*Bathroom*, 2014  
 Cinema 4D, 1024 x 768





Fig. 24. Haiden Park  
*Bedroom*, 2014  
 Cinema 4D, 1024 x 768



Fig. 25. Haiden Park  
*Outside Floor*, 2014  
 Cinema 4D, 1024 x 768

# Camera Movement

I decided to plan the camera movements before doing the lighting, because this would be the most important part of my thesis. With the camera movements, I was going to show the whole exterior and interior of the house as in an advertisement. Creating the cameras was easy, and I installed six cameras total at first. The first camera starts from the outside and goes into the hallway. The second camera starts from the hallway and goes into the dining room. The third camera starts from the dining room and goes into the kitchen. The fourth camera starts from the kitchen and goes into the living room. The fifth camera starts from the living room and goes into the bathroom, and the last camera starts from the bathroom and goes into the bedroom (*Fig. 26*).

While creating the cameras were easy, I ran into a few problems, such as with pacing. At first the video was supposed to be one minute long, but I noticed that the pacing of showing the house was short. It would go so quickly that it wouldn't show the details. By doing a few test renders, I finalized the video into 1 minute and 30 seconds. The second problem that I ran into was that during the rendering, some of the files wouldn't render and came out black. Usually when I render a video I don't render the whole video but render png sequences and put them together. Using this method, I noticed that some of the files came out black. At first I thought it was just the cameras, so I recreated the cameras and test rendered the video again. But again, some of the files came out black, so I kept on repeating the process of creating the cameras and test rendering a few times. I went back to the file and then noticed that while the camera was moving through the house, it was hitting some of the walls and objects.

I noticed that this was the same frame that became black when it was rendering. So I recreated the movements of the camera and test rendered it again. This time instead of becoming black the files showed up but became darker than the other frames. So I decided to change the movements of the camera, which solved the problem. Next I used the stage tool to create one big camera movement. The stage tool (*Fig. 27, Fig. 28*) can connect the cameras, environment, sky and background to create one sweeping movement. You select a camera keyframe as the starting point and endpoint, then you click on the second camera and make the keyframe the starting point at the endpoint of the first camera. By repeating this method you can create one movement with several cameras.

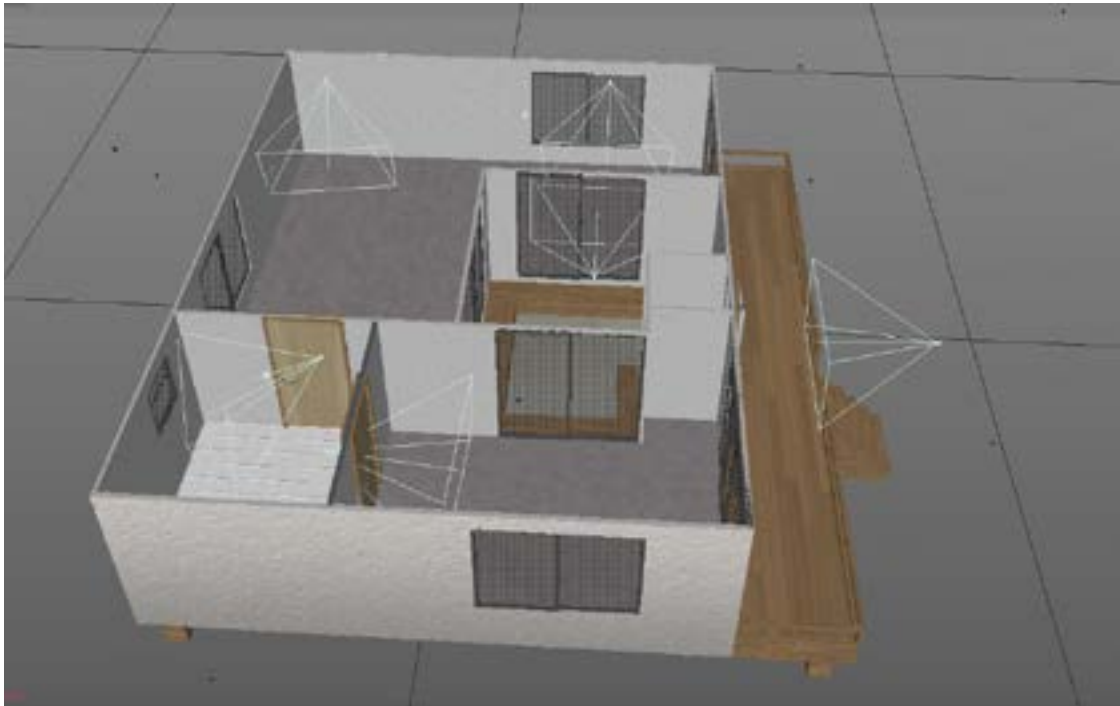


Fig. 26. Haiden Park  
*Camera Movement*, 2014  
Cinema 4D, 1024 x 768



Fig. 27. Haiden Park  
*Camera Stage*, 2014  
Cinema 4D, 1024 x 768

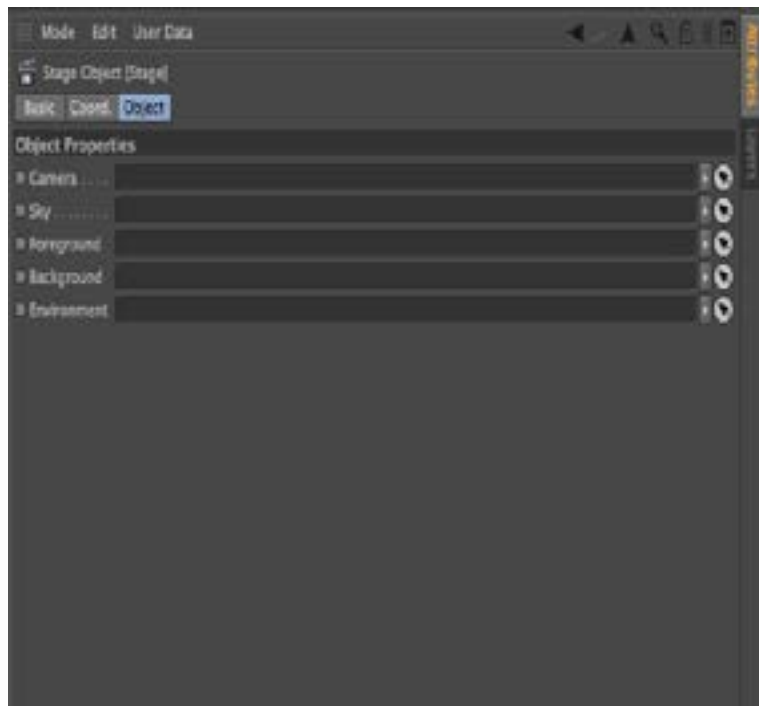


Fig. 28. Haiden Park  
*Camera Stage*, 2014  
Cinema 4D, 1024 x 768

## Views from the Camera



Fig. 29. Haiden Park  
*Camera View*, 2014  
Cinema 4D, 1024 x 768



Fig. 30. Haiden Park  
*Camera View*, 2014  
Cinema 4D, 1024 x 768



Fig. 31. Haiden Park  
*Camera View*, 2014  
 Cinema 4D, 1024 x 768



Fig. 32. Haiden Park  
*Camera View*, 2014  
 Cinema 4D, 1024 x 768

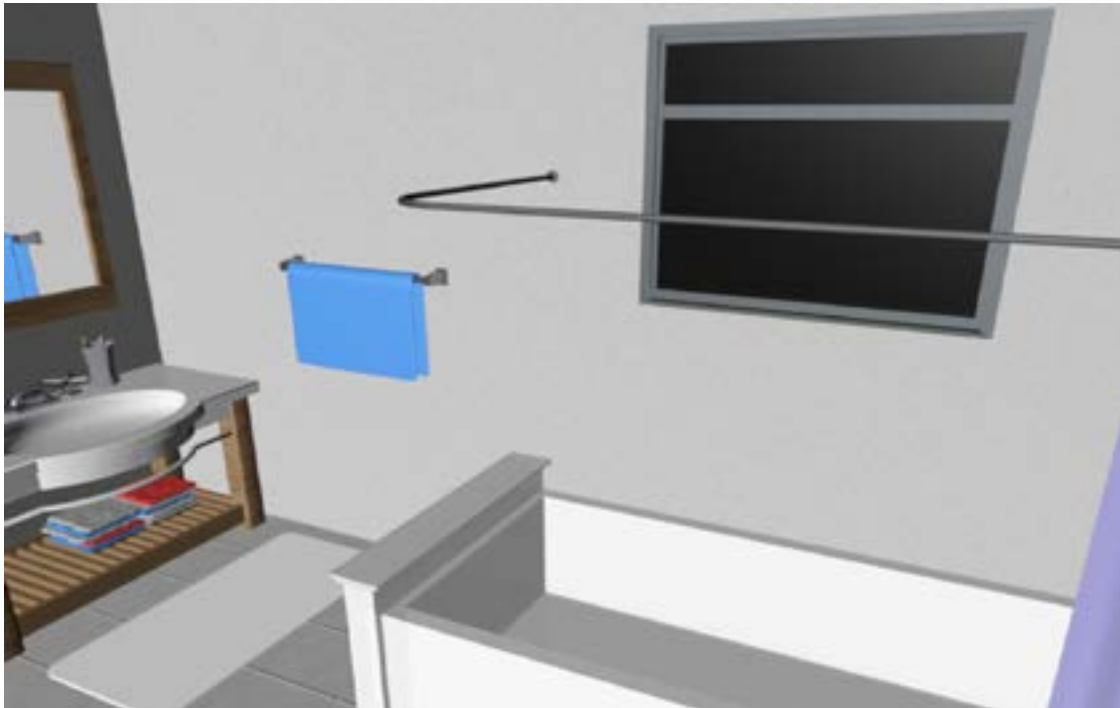


Fig. 33. Haiden Park  
*Camera View*, 2014  
 Cinema 4D, 1024 x 768



Fig. 34. Haiden Park  
*Camera View*, 2014  
 Cinema 4D, 1024 x 768

# Lighting

After finishing with the camera movement, I started to create the lighting. Originally my idea was to create lights inside the house. But then after some thought, since this is a video showing the whole house, I decided that while the camera was moving it would be good to show that time also changes. I wanted to show all aspects of the house, including both day and night. At the start of the video it is morning, and when the video ends it's night.

To create the time change, I first created a light called the sun. By creating the sun I could keyframe the starting point and ending point. As the video plays the sun moves around to show the time changing. While doing this I ran into a problem where even though the sun moved when I rendered it, nothing was rendered except a blank black page. I messed with the time frame, latitude, longitude, and distance but nothing changed.

After looking at some tutorials I noticed that you can change time differently so I deleted the sun light. Instead I used the physical sky, which allowed me to control the sun and the sky (*Fig. 35, Fig. 36*). The physical sky gave me a lot of options to control; within the sun tab I could control the time frame like the sun light and I could control the shadows coming from the sun(color, density, and distance). From the sky tab I could control the horizon line, add clouds to the sky, change the night intensity ratio, and control the saturation, hue, and gamma correction. I could also show the moon, stars, and planets and insert a sky dome light in the details tabs. For my video I controlled the horizon line; inserted clouds, the moon, and stars; controlled the saturation, hue, and gamma correction. After I keyframed the starting point to 9:00 a.m. and endpoint to 8:00 p.m. After creating the physical sky I did a test render and noticed that the interior of the house was actually a little dark. So I added one or two lights (white) with the intensity around 50 to 60 (depending on the room) for each room to light up the rooms themselves (*Fig. 37*).



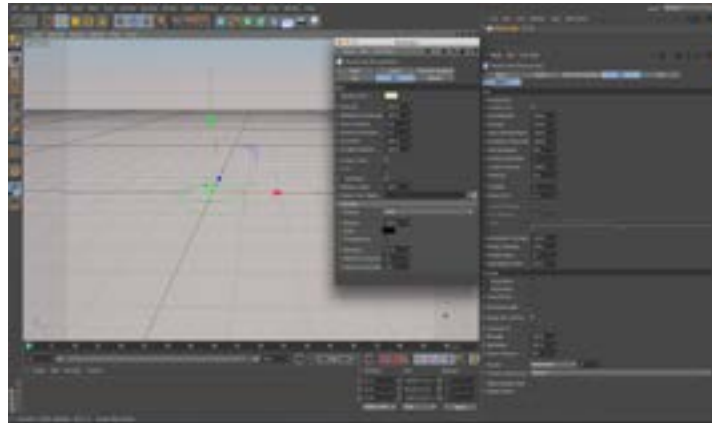


Fig. 35. Haiden Park  
*Physical Sky*, 2014  
 Cinema 4D, 1024 x 768



Fig. 36. Haiden Park  
*Physical Sky*, 2014  
 Cinema 4D, 1024 x 768



Fig. 37. Haiden Park  
*White light*, 2014  
 Cinema 4D, 1024 x 768



# Environment

After creating the lights I proceeded to create the environment of the house. Since the first camera starts from the outside, the environment is important. For the floor I created a floor plane and then textured it with a grass texture. Then I started to create the trees and bushes for the environment. At first I started to model the trees in Maya by using the workflow that I have been using for a while now, which is to create every element separately and then combine them together. I created the trunk first with the branches on it, then created the leaves and started to duplicate them while giving them little twists individually to show they were slightly different. I had some trouble creating the branches because whenever I smoothed the polygons they wouldn't look the way I wanted. I did some research to find out if there is a way to create trees; I found out there is a program called XFrogs that can be used to create 3D tree models. This program is a plugin for Cinema 4D, and from looking at the tutorials I knew this was the program I wanted. Since this was the first time I had used this program, I started to look into tutorials on it and slowly modeled my own tree. I had some trouble because it was my first time using this plugin, and it took me a while to model it. But finally the tree came out the way I wanted it (*Fig. 38*). After creating the trees, I started to model the bushes. This went much more quickly because I had some experience from modeling the tree (*Fig. 39*).

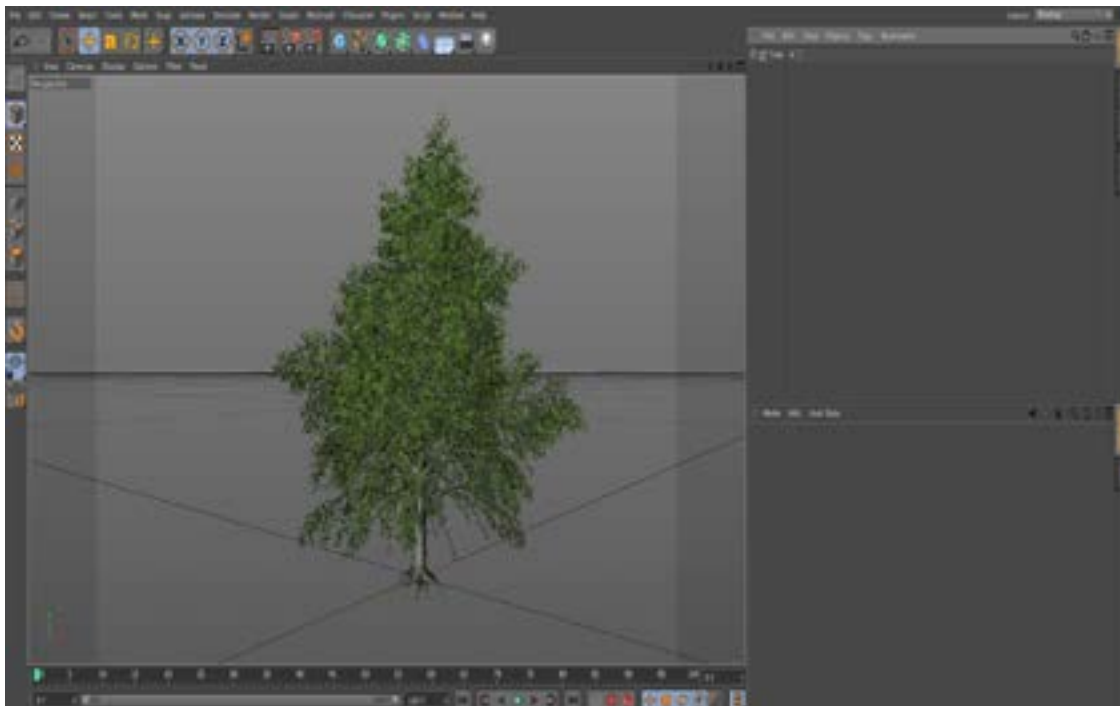


Fig. 38. Haiden Park  
*Tree*, 2014  
Cinema 4D, XFrogs, 1024 x 768

After creating the tree and the bush, I placed them next to the house. At first I wanted to place them near the windows where they could be seen from the inside. One could only see the plants for a few seconds in the first part. So I wanted the viewers to see the plants when they were inside. From the inside view the window looks empty, so I wanted to fill the space. After placing the trees, I placed the bushes in front of the porch because it also looked empty without them (*Fig. 40*).

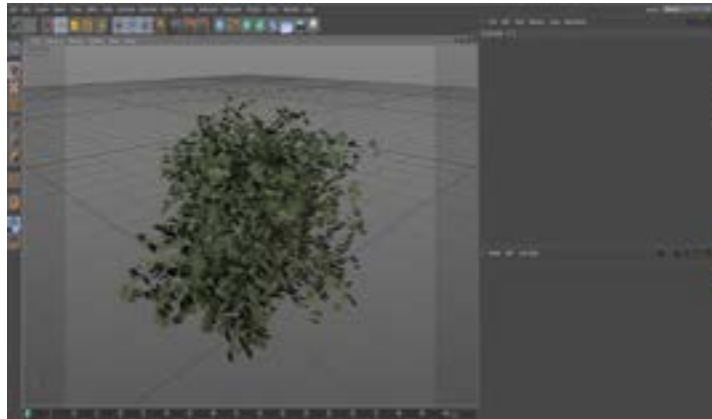


Fig. 39. Haiden Park  
*Bush*, 2014  
Cinema 4D, XFrogs, 1024 x 768



Fig. 40. Haiden Park  
*Environment*, 2014  
Cinema 4D, XFrogs, 1024 x 768

# Revisions

After creating everything and rendering it, I presented my video to my advisors. They approved the models and some parts of the video. But the flow of the camera movements were awkward and the horizon line was weird. Also the lights in the interior were too bright and were not supposed to be white, and the environment was also awkward. After meeting my advisors I started to make revisions. I started with the background environment. In *Fig. 40*, the horizon between the sky and the ground is off, and the floor is expanding infinitely because I created a floor object in Cinema 4D. At first I just created a plane, but then it looked weird, so I decided to create a fence with a front gate. This would block the horizon line, and with the house inside the fence it would narrow the empty space and make it look fully compact (*Fig. 41*). For the front gate roof, I used the traditional Ki-wa material and then modeled pillars to support the roof. For the texture I used wood textures for the pillars and then light gray wood textures for the gate roof. For the fence I just created a rectangular polygon surrounding the house, and for the textures I used a stone wall texture and added a displacement map and bumps to make it look realistic. The fence looked kind of empty, so I added the finishing touch by putting Ki-wa's on top of the fence.



Fig. 41. Haiden Park  
*Fence*, 2014  
Cinema 4D, 1024 x 768

The next revision that I made was the camera movement. When I created the fence the number of cameras increased. After I increased the number of cameras, the starting point changed as well. Instead of starting in front of the door, the video started in front of the front gate of the fence and went through the gate, walking up the walkway (Fig. 42). Then I started using stop motions for my camera whenever it reached a scene where there was a traditional object in the room. In my original storyboard for my thesis, when the camera entered a room it would transition to a traditional room to see the difference between the modern room and a traditional room. But because this transition didn't quite work out, I disregarded the idea and just went with the camera movements. When it was moving, one couldn't really tell which ones were traditional objects and where they were located. Even though it made the video a little longer, I decided to add some stop motion whenever there were any traditional objects in the room. For instance, in Fig. 43 the camera stopped for two seconds to show the object. After creating the stop motions, I went into After Effects to add text so that the viewers could distinguish which ones were the traditional objects (Fig. 44). Since I didn't show the transition from new to old like my original idea, people wouldn't know about the things that I had changed. So I decided to input an explanation of the object into the video.



Fig. 42. Haiden Park  
*First Camera*, 2014  
Cinema 4D, 1024 x 768



Fig. 43. Haiden Park  
*Camera Stop*, 2014  
 Cinema 4D, 1024 x 768



Fig. 44. Haiden Park  
*Camera Stop*, text, 2014  
 Cinema 4D, 1024 x 768

The last revision that I made was the lighting in the house. After I met with my advisors, I saw that the lighting was the biggest problem in the video. As I mentioned before, because I used the physical sky for the time change, the lighting inside was dark. So I created white lights to brighten the rooms, but this made the whole scene look unrealistic. One of my advisors told me that if you look into a photo that was taken by a camera, there are warm colors and cool colors in the lighting. For instance, if you take a photo with a window in it, the sky is blue and because of the sunlight, the inside becomes warm yellow or orange. I changed all my white lights to yellow or orange lights and decreased their intensity. While changing the lights, I faced another problem. Whenever I created a light in the kitchen, part of the wall became really bright, which was really bothersome. The same happened to the wall in the living room. I didn't notice it when the light was white, but after changing the lights to orange it became really noticeable that only those parts of the walls looked unrealistic. First I tried to decrease the intensity and darken the color of the light that was affecting those walls, but it looked the same. Then I tried moving the lights somewhere else, but this didn't really change anything either. So I decided to increase the number of lights and make them only affect those walls; this made some changes, but they were not drastic. Finally, after messing around with the lights, I changed the shadows of the light and turned on Ambient Occlusion, and this resulted in the changes I wanted.



The other problem I had with lighting was the bedroom. Since the time changes in the video, when the camera goes into the bedroom it becomes night. At first, since it was night the bedroom especially was really dark, so I made it bright with the white light. Then it was unrealistic and it didn't look like it was nighttime. So I changed the light to yellow and decreased the intensity in the bedroom. After that I inserted the two lights next to the lamp that I modeled in the bedroom, and the lighting changed slightly but not drastically. I didn't notice right away, but after a few trials of decreasing the intensity and making the colors of the light darker, I noticed that the lights from the hallway were affecting the bedroom. Since the bedroom door is a sliding glass door that connects with the bedroom, the light in the hallway was affecting the room drastically. So I did a trial render without the lights in the hallway and the room became darker. But then when I turned the lights from the hallway off it also affected the hallway, and it became darker. I keyframed the hallway lights and made them light up when the camera was passing the hallway and then turned off the intensity when the camera reached the bedroom. Also, the bedroom appears dark because it is nighttime, so the lamp should be on like in real life, but it didn't really look like it. I increased the light intensity a little inside the lamp and added a glow to the paper texture of the lamp so it looked like the lamp was lit up. I did the same thing with the desk lamp. After changing the lights, for the finishing touch, I included shadows for the lights (Fig. 45).



Fig. 45. Haiden Park  
*Bedroom light*, 2014  
Cinema 4D, 1024 x 768

I met with my advisors again and they liked the changes I had made, but I still had a few problems. The horizon was still a little weird, and because of the view from the first few seconds, you can tell that except for the house and the fence, the surroundings are empty. The camera movement was a little awkward with the stop motion, and the lighting in the bedroom was not quite bright enough. After hearing these problems, to fix the horizon I decided to change the view for the starting point. Instead of showing the whole scene from the start, I decided to start right in front of the gate so it wouldn't show the horizon line and would fix the emptiness in the scene. By starting from the front gate, I thought it would be good if I hid the house at the starting point to make it appear as a surprise. So I created doors for the front gate, and while the cameras were moving through the doors, they would open and show the house (Fig. 46). To fix the problem with the stop motion, I decided to ease in and ease out of the movements. Instead of stopping when the traditional object is shown, I made the movements really slow, so even though it's moving you can still see the object for a few seconds. For the light, I decreased the light intensity drastically from the lamp and also deleted the bedroom light that was in the middle, making it darker. With this change you can tell that it's nighttime when you get into the bedroom.



Fig. 46. Haiden Park  
*Starting point*, 2014  
Cinema 4D, 1024 x 768



# Animation

After creating all the camera movements in Cinema 4D, I also made some changes to my animation. When I took out the stop motion and eased in and out on the traditional objects, I also took out the text in the animation. Since there are some repeating objects, I only input three texts into the animation: the traditional lamp, the traditional room divider, and the traditional bookcase. But it was kind of awkward just seeing three texts inside the animation, so I decided to discard the texts. Instead, I decided to input graphic images related to the traditional objects. For instance, for the traditional bookcase I inserted a text box with graphic images related to the object and some descriptions inside it. This would show how I adapted it for the architecture but would also allow people who don't know much about Korean history to learn about the traditional object that I inputted (*Fig. 47*).



Fig. 47. Haiden Park  
*Bookcase text*, 2014  
Cinema 4D, 1024 x 768

After showing the animation and talking with my advisors, we both agreed that there was a lot of text within the few seconds it was displayed. Since there was a lot of text within the few seconds I couldn't read what I was saying and if I can't read it then the viewers definitely can't read the text. Also everything was in full color so the viewers who don't know anything about the Korean Traditional Object wouldn't know which item I was explaining so I decided to highlight the object. So what I did was make everything in the picture grayscale except for the object that I was explaining. Also since the viewers can't read the explanation of the object I decided to bullet point the key factors in the text. (Fig. 48). After creating the animation there was another problem that my advisors mentioned later on. I couldn't use the graphics images because they were copyrighted, so I decided to remove the images and just show the key factors.

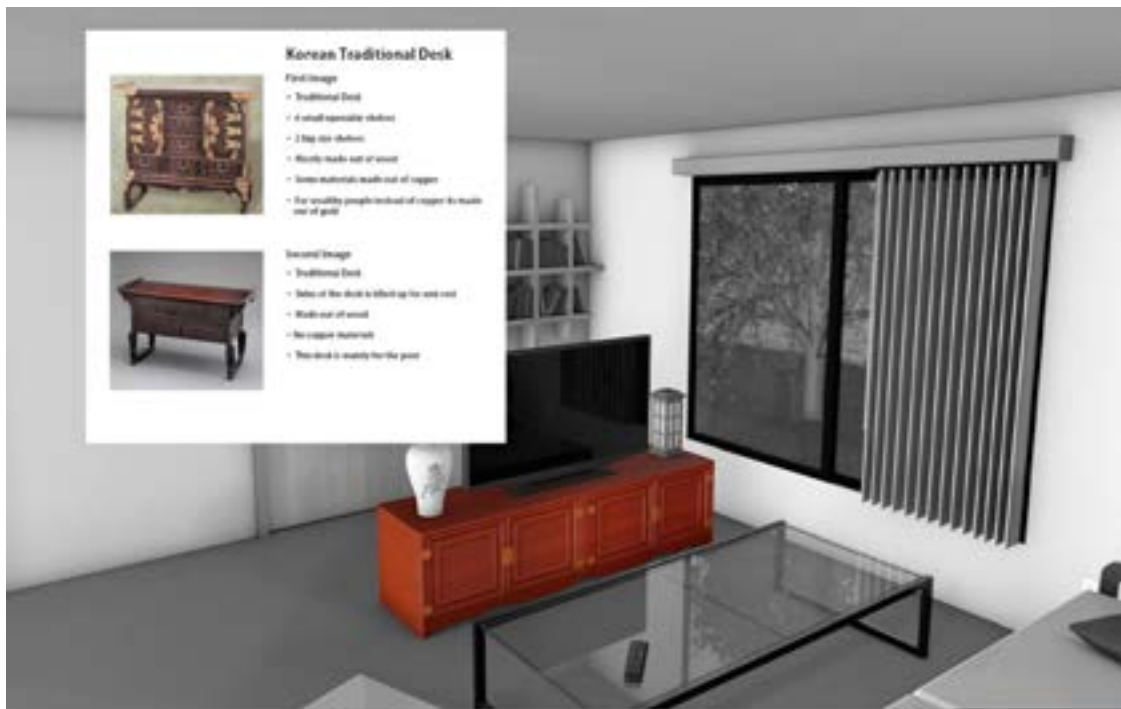


Fig. 48. Haiden Park  
Bookcase text(Grayscale), 2014  
Cinema 4D, 1024 x 768

# Usability Testing

For my usability testing I wanted to test out the camera movements, since it's the most important part in my project. I did my testing during Imagine RIT, a festival held by RIT where people come in and watch students projects. Since I just wanted to test out the camera movements, the video that I presented that time wasn't finished, it only had basic models and the house itself. During my usability testing a lot of people were interested in my project but only a few made comments about it. After testing out my project to different people most of them made similar comments about the camera movements.

The video that I showed was about a minute long, in which I originally planned, with the outside background and six rooms that I have you could say that it took about seven to eight seconds per room. They commented that the movements were fast and that they couldn't really tell what was going on. Since this video was the purpose of showing how I integrated Korean Traditional Style objects and cultures into modern architecture, it was important for people to notice how it changed. If people couldn't tell the difference then there was no point of creating this video. Also this video only had basic models in it so if I had all of the models, it would be more difficult for the viewers to see. Also some of the comments that people made were the movements. It wasn't really smooth enough.

At this point of time there was no stop motion or ease in and ease out in the video so that took care of the problem. After analyzing the comments, I increased the length of the video to a minute and 30 seconds. Also like I mentioned before I inserted the stop motion when the camera showed the object, which changed into ease in and ease out motion.

# Summary of Research

Throughout this whole thesis project, I learned a lot and I can't express how much I grew as a designer. I established some goals when working on this project, and I felt that I achieved far beyond the goals I have setted. I learned a lot about modeling, the program Cinema 4D and especially cinematography.

At first I came to RIT to expand my skills as a 3D modelist. I was interested in becoming familiar with 3D modeling, lighting techniques, and texturing techniques. I learned some basic 3D modeling skills when I was an undergraduate in industrial design, and I wanted to learn more and expand my skills as a 3D modelist. I was determined to explore all of these areas within the two years. Going to school helped me learn all the skills that I wanted to develop, and it also opened up my eyes to a new world of motion graphics. Experiencing motion graphics for the first time and applying my 3D models into motion graphics helped me realize that I wanted to be part of this new world. I also became interested in other techniques such as particles and dynamics, 3D motion techniques, and camera movement techniques. This helped me expand my design skills to another level. With the knowledge that I learned, I had a perfect opportunity to apply all of the things that I learned into my thesis project. I applied them to create a new futuristic house while keeping aspects of the traditional culture and objects.

Lastly, due to the time constraints and my lack of software knowledge, in the future I would like to learn more about 3D motion with Cinema 4D, modeling techniques in Maya and cinematography. I still feel that I am not strong enough in these areas and I would like to improve more and input them into my workflow. Learning this would help me in the future and help me expand my skills to become a successful 3D motion graphics designer.

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